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TITLE: Do the Effects of Exercise on Breast Cancer Prevention  
Vary with Environment?

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| <b>13. ABSTRACT (Maximum 200 Words)</b><br>Does walking outdoors have the same breast cancer protective effect as walking on a treadmill indoors, away from natural light, in a typical gym atmosphere? Is the ambient exposure to sunlight important in stress and breast cancer risk reduction? Our basic premise is that the breast cancer protective mechanisms of exercise depend on context of exercise, not just on the number of repetitive muscular contractions completed over a specific period of time, and that a more pleasant and peaceful environment will decrease perceived stress and enhance immunity, theoretically leading to more positive mood and more effective cancer surveillance. A more relaxed walking atmosphere may decrease physiological consequences of stress, such as high cortisol and depressed natural killer cell function. Revisions to the original endpoints include adding a questionnaire to assess mood changes, and including of physiological measures of immunity and stress (B endorphin, adrenal hormones (catecholamines and cortisol), free fatty acids (as a surrogate for free tryptophan), and immunity (serotonin, NK cell numbers, NK lysis, and activation by interferon gamma). By focusing on the context of exercise (indoor versus outdoor), we will be able to better define the important aspects of exercise on breast cancer prevention. |   |  |   |                                  |
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## **Do the Effects of Exercise on Breast Cancer Prevention Vary With Environment?**

### **Introduction**

The purpose of this study is to investigate whether exercise outdoors has the same breast cancer protective effect as exercise done indoors away from natural light in a typical gym atmosphere on a treadmill. It has also been suggested that sunlight, often a concomitant exposure associated with exercise, can reduce breast cancer risk. This raises the question of whether exposure to sunlight during exercise correlates with reduced susceptibility to breast cancer? The basic premise is that the breast cancer protective mechanisms of exercise depend on context of exercise, not just on the number of repetitive muscular contractions completed over a specific period of time, and that a nicer, more peaceful environment will enhance NK cell number and function, theoretically leading to more positive mood and more effective cancer surveillance. A more relaxed atmosphere and mindset could decrease physiological consequences of stress, such as cortisol and natural killer cell function. Revisions to the original endpoints include adding a questionnaire to assess mood changes (Profile of Mood States), adding physiological measures of immunity and stress (B endorphin, adrenal hormones (catecholamines and cortisol), free fatty acids (as a surrogate for free tryptophan), and immunity (serotonin, NK cell numbers, NK lysis, and activation by interferon gamma). By focusing on immunity and mood, as modified by exercise and context of exercise (indoor versus outdoor), we will be able to better define the important aspects of exercise on breast cancer prevention.

## **Body of Report**

### **Task 1. Develop Plan for Study Computer Database, Months 1-3**

- Normal study values will be entered for each outcome variable, so out-of range values will immediately alert investigators to potential problems. Since all analyses are being performed at the end of the study, rather than concurrent with the study, and normal values may not be relevant, we are plotting the values longitudinally for each patient to see where an individual's values might have varied.
- Access database will be developed to monitor each volunteer and to record data from laboratory analyses and medical histories.
- Tracking system is in place.

### **Task 2. Obtain IRB approval from local institutions (Palmetto Health Alliance and the University of South Carolina).**

- a. Done

### **Task 3. Obtain IRB approval from the U.S. Army**

- HSRRB met on October 10, 2001 to review the grant.
- HSRRB Board members recommended approving this protocol with modifications October 19, 2001.
- Modifications were accepted
- However, no use of human subjects could begin until the University of South Carolina made arrangements for insurance, to be paid by the U.S. Army. Negotiations between the University of South Carolina and the US Army were completed in February 2003 but the HSRRB approval had expired.
- Based on new published literature and new understanding of the effects of exercise, this study was re-designed to include Quality of Life, and added physiological measures of immunity and stress (beta endorphin, adrenal hormones (catecholamines and cortisol), free fatty acids (as a surrogate for free tryptophan), and immunity (serotonin, NK cell numbers, NK lysis, and activation by interferon gamma). These endpoints replace VEGF, HIF-1, 2 OHE1/16 a-OHE1, and vitamin D receptor levels.
- The re-designed endpoints were submitted to the Human Subjects Protection Specialist in May 2003. The suggested changes to the study were accepted, and the protocol is expected to go to the HSRRB in October 2003.

### **Task 4. Subject Recruitment and Study, Months 5-7**

- NO RECRUITMENT has been done, as the final approval for the use of human subjects has not yet been granted.

### **Recruitment of healthy volunteers and selection of eligible subjects is estimated to take 3 months.**

- We will rely on word of mouth to recruit healthy postmenopausal women who regularly exercise and take no medications. The study for each participant will last 2 weeks.

**Task 5. Data Analysis of Results from Healthy Volunteers, Months 8-12**

- Meetings with oncologists and member of the Exercise Sciences Department at the University of South Carolina to present preliminary data.
- Meetings will take place as soon as the data are available.
- Final meeting with volunteers to explain study results and to answer any questions.
- Meeting is scheduled for September 2004 by which time all the analyses should be completed.
- Annual report to USARMC
- This is the annual report to USARMC.

## **Key Research Accomplishments**

- Narrowed the scope of the research to include only women living at approximately 300 ft (100 meters) in Columbia, South Carolina.
- Replaced Dr. Stephanie Muga as a co-PI with Dr. Mark Davis, Director of Exercise Biochemistry Laboratory at the University of South Carolina will be the new Co-PI.
- Refined the biological endpoints and added Quality of Life and changes in immunity.
- Received approval for the University of South Carolina- US Army insurance negotiations.
- Received verbal approval of the proposed changes to the protocol.

### **Reportable Outcomes**

- None yet. Volunteers will be recruited in spring (warm ambient temperatures for outdoor walking) of 2004, and the study will begin at that time.

**Conclusions**

- Human Subjects concerns and Scientific Review concerns have been met, and we are waiting for HSRRB final approval.
- Specific results of the study are not yet available.
- The U.S. Army and the University of South Carolina have negotiated issues of insurance coverage.

## References

- Not applicable

## **Appendices**

- None yet.

### **List of Personnel**

- P.I. Jane Teas, Ph.D.
- Co-P.I.: J. Mark Davis, Ph.D.
- Project Director: Senthil Raghavan, MBBS
- Medical Monitor: Leah Oman, M.D.
- Statistician: Daniela K. Nitscheva, Ph.D.